Author's Response:

Dear Mr. Dominik Brunner,

Thank you very much for your comments and suggestions for this manuscript. We appreciate it very much. All the suggestions have been included. And the following answers are made (in blue) regarding the remarks in the comments.

1. Title: The new title of the method "Adaptive selection of diurnal least variation" sounds less correct to me than the previous title. Even though I am not a native English speaker, I am quite sure that the adjective "least" can not be used in this way. A variation can be small but not less, and thus it can be smallest but not least. Actually, I don't think that anything was wrong with the previous title " Adaptive Selection of Diurnal Minimum Variation", but rather that the method was later called "Adaptive Diurnal Minimum Variation" which sounds like the "variation" would be "adaptive" rather than the "selection". I would propose to call the method "Adapative Selection of Diurnal Minimum Variation (ASDMV)" or, closer to the present name, "Adaptive Diurnal minimum Variation Selection (ADVS)".

Thank you very much for your explanation and suggestion. We decide to call the method as, "Adaptive Diurnal minimum Variation Selection (ADVS)" throughout the manuscript.

2. Please note that it is standard practice to present validated rather than raw data, and therefore the emphasis on "validated data" in this manuscript is quite confusing. Furthermore, I would refer to such data as "calibrated and quality controlled" rather than "validated", since validation typically requires comparison against independent data.
"Data selection", on the other hand, is a very general term that is not necessarily associated with baseline data selection. I am, therefore, not particularly happy with the usage of the terms "validated data" and "selected data" in this manuscript as they are prone to confusion, but since the terms are introduced at the beginning, it is probably ok but certainly not ideal.

Thank you very much for your explanation and concern. We decide to keep the terms "validated data" and "selected data" in the manuscript, and frequently show the focus on "baseline data selection" as you suggested in your comments.

3. Since THO requires data a sub-hourly resolution (or a measure of subhourly variability), this method was probably applied only to a subset of data. If that's the case, this should probably be mentioned here.

We still keep the first step of examining the within-hour variability for THO in case of evaluating data with higher time resolution. For hourly data, this step is automatically skipped

for the R programming routine.

Therefore, we added a sentence here, "For the hourly data used in this study, the within-hour variability is not applicable so that the first step is skipped."

4. What do you mean by "external influences"? External of what?
   The main things that remain when filtering trend and seasonal components are (i) synoptic variability, (ii) diurnal variability (not relevant because your method esssentially removes diurnal variations), and (iii) local influences. I would not call any of these components "random". You may say that the remainder component "resembles random noise" since it is not correlated between sites, but it is certainly not a random signal by origin (except for the random noise of the instrument which should be quite negligible in hourly values).

We completely agree. We used "external influences" here defined as the synoptic variability in combination with local influences. And we used "random noise" here for the structural characteristics of the residues (or remainder).

Therefore, we combine the first two sentences as, "The remainder component resembles by its structure to random noise from local influences, being basically different from site to site and statistically uncorrelated with the general signal of CO_2 concentrations in the lower free troposphere."

5. I don't understand the colorscales in Figure 6. They seem to be useless and should probably be removed.

The color scale in Figure 6 is removed.

6. "data selection method" is way too general!!You need to mention the purpose of the data selection in this sentence, e.g. "baseline data selection method" or a "novel statistical method for selecting representative baseline data"

We rephrase it as, "novel statistical method for selecting representative baseline data."

7. you need to briefly mention the characteristics that were consistent. Otherwise this sentence says nothing.

We rewrite this sentence and the previous one as, "The ADVS method resulted in an increasing number of percentages of selected data representing the background conditions with growing altitude of continental measurement sites, which is reasonable due to the underlying atmospheric dynamics. For comparison, three well-known statistical data selection methods were applied to the same datasets and most methods yielded similar increasing percentages

with growing altitude."

8. The conclusions section should be understandable without reading the rest of the text. The reader will likely not understand the meaning of "validated" versus "selected" data in this section.

We change "all validated and selected datasets" to "all datasets before and after data selection", and adjust "the validated datasets" to "the datasets before selection" in the next sentence.

9. You need to explain what was correlated against what, since otherwise it is impossible to understand the significance of this paragraph.

We rewrite the sentence as, "For the combination of trend and seasonal components by STL, higher correlation coefficients between stations were found with ADVS data selection than SI and THO. Inversely, ADVS resulted in lower correlation coefficients between stations in the remainder components than the other methods. Both indicate a better performance of selecting baseline data by ADVS."